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DISEASE CARRIERS[1]

THE past two decades have witnessed many notable achievements in medicine, chief among which, as regards the infectious diseases, stand the discovery of the curative sera, and the more recent discovery of specific chemical agents for the treatment and cure of disease. The real, ultimate goal toward which the research work bearing on human and animal infections points is, and must be, the cure of the afflicted. No royal road leads to the desired end, but instead numberless trails must be blazed which too often lead seemingly to nowhere. While the crowning achievement, the direct conquest of disease, is the aim, the investigator from the beginning has endeavored to accomplish essentially the same result by preventive means. The search for the cause of disease, the recognition of the portals of entry and exit, the perfecting of methods of disinfection, and the development of preventive inoculation served to build up a fairly effective basis for prophylaxis. These methods would, indeed, have sufficed had the earlier views regarding the spread of disease been correct. The general knowledge regarding the highly contagious diseases made it seem probable that all infections were spread, more or less directly, from the sick to the healthy, and as a result preventive measures were applied to the patient and to his immediate surroundings. The outcome, however, was not always satisfactory and the reason is not difficult to see. Fully as

[1] Address of the vice-president and chairman of Section K, American Association for the Advancement of Science, December 29, 1911.

important as a knowledge of the germ itself is the fundamental fact that disease may be conveyed through the agency of apparently healthy insects, lower animals, and even man himself. It is the recognition of this fact, the existence of *disease carriers,* which has brought about such remarkable results in the fight against malaria, yellow fever, Malta fever and many other diseases. Hence a brief outline of our knowledge of this interesting subject may not be out of place.

It may be well at the outset to state that the term "disease carrier" is applied to animals or persons who, though apparently in perfect health, harbor and eliminate a given disease germ. The fact that the "carrier" is an apparently healthy animal means that the disease may be spread through a wholly unexpected source. The old view of the transmission of disease by contact with the sick remains true, but it is enlarged and supplemented by newer facts. Since more or less direct contact with the apparently healthy carrier, or with the actually sick serves to spread an infection, it is clear that preventive measures must consider the former as well as the latter.

Strange as it may seem, the existence of certain carriers, though not their import, was recognized in the early days of bacteriology. Thus, the presence of the microbe of sputum septicemia in the mouths of healthy persons was noted independently by Sternberg and by Pasteur, in 1880, but it was not until several years later that this organism was shown to be the cause of lobar pneumonia. The frequent persistence of this organism in the sputum after recovery was observed at an early date.

An even more striking example was furnished with the discovery of the diphtheria bacillus in 1883, for Loeffler not only found this organism in the sick, but also in some perfectly healthy children. So contradictory to the accepted order of things was this fact that for several years it prevented the full recognition of this germ as the cause of the disease. The more thoroughly this disease was studied, the more it became evident that recovery did not mean an immediate disappearance of the pathogenic microbe. In other words, clinical recovery did not assure freedom from danger to others. The early recognition of this fact led to the establishment of the bacteriologic control of the recovered patient in the form as it now exists in practise. Two or more consecutive examinations of the throat and nose must yield negative findings before it can be said that the danger of spreading the infection has been overcome.

The presence of the pathogenic agent in the active stage of the disease is a necessary condition; the persistence of such agent during convalescence is more or less to be expected, but the continued existence, at times, of the organism in the individual after complete recovery, and its presence in persons who apparently have never had the disease is somewhat difficult of explanation. The three types thus alluded to are conveniently designated as (1) *convalescent,* (2) *chronic* and (3) *healthy carriers.* The latter in the majority of cases perhaps includes individuals who, at some time, and unknown to them, have had an attack of the disease; they are therefore virtually chronic carriers. Others, though healthy, may be in the incubation stage and hence develop the disease some days later. Lastly, a third group would include strictly healthy carriers, those who have never had the disease and are only remotely liable to it. Obviously, then, it is difficult to distinguish between these several groups of healthy carriers.

DIPHTHERIA

As regards diphtheria, investigations have shown that the healthy carriers are never found in regions free from the disease. They are met with only in places where the disease prevails; the home, hospital, asylum, school and, naturally, the large city furnish examples, though in extremely variable number. Intimate association with the patient, either before or during sickness, as is likely to occur in the home, yields the largest percentage of such carriers. This is especially true where preventive measures, such as isolation and disinfection, are not enforced at the outset. Under such conditions it has been found that fully one third of the exposed become carriers for a greater or less length of time. Where proper measures are instituted early, the number is necessarily greatly reduced. Systematic examinations made in the large cities have, time and again, demonstrated the presence of healthy carriers in from 2 to 4 per cent. or more of the persons tested.

The persistence of the organism in the healthy carrier is usually, and fortunately, of short duration, though exceptionally it may continue to be present for months. Such carriers are unquestionably a source of danger to others and serve to explain outbreaks of the disease where contact with a sick person is positively excluded. The fact that the blood of a majority of the healthy carriers possesses antitoxic properties indicates clearly that they have passed through a previous, though unrecognized, mild infection and consequently that they really belong to the type of chronic carriers. A small number of the healthy carriers may eventually themselves develop the disease, while others, for some unknown reason, escape infection.

The convalescent and chronic carriers are properly looked upon as being dangerous to the community. It is a well-recognized fact that the diphtheria bacillus persists in the throat and nose, for a variable period of time, after the disappearance of all clinical symptoms of the disease. It may remain present for a few days, weeks or months. Fortunately, the vast majority rid themselves of the invading organism in a relatively short time, but as long as they harbor the organism they are in a position to infect others. Isolation, under such conditions, is just as necessary as in the acute stage of the infection. The really chronic carrier, the one who harbors the germs for months, if not years, presents the most difficult problem.

TYPHOID FEVER

The studies on typhoid fever during the past few years have been especially fruitful in enlarging our knowledge of human carriers and have served to concentrate attention to the important part played by these in the propagation of the disease. The accepted cause, the typhoid bacillus, is known to be present not only in the intestines, but also in the internal organs and in the blood. Because of the latter occurrence the majority of typhoid patients, after about the twelfth day of the disease, eliminate the typhoid bacillus in the urine, at times in enormous numbers, and such elimination may continue for weeks after complete recovery has taken place. Exceptionally, the typhoid bacillus may persist in the urine or discharges for months, and years, if not through the remainder of life.

The problem of the healthy carrier is one of special import. Here, as before, we have those who have undoubtedly passed through a previous mild and unrecognized attack of the disease and hence are of the type of true chronic carriers; as such, they are to be looked upon as particularly dan-

gerous. Others there are who but temporarily carry the organism, which soon disappears from the intestine if the source of supply, such as contaminated milk or water, is withdrawn. In these the natural resistance, whatever that may be, is such as to prevent the organism from gaining a foothold and consequently it is soon got rid of. The individual is and remains healthy, and, because of the temporary presence of the organism, is of relatively little danger to others. On the other hand, the healthy carrier may turn out to be in the incubational stage of the disease, the first symptom of which may appear in several days, or two or three weeks after the detection of the bacillus.

During convalescence from typhoid fever, presumably because of persisting lesions, the specific organism continues to be eliminated for some time. In general, however, after the tenth day following the disappearance of the fever, the typhoid bacillus disappears from the excretions of the convalescents, except from about 10 per cent. Most of the latter clear up in from three to four weeks, while others become true chronic carriers.

The chronic bacillus carrier is of especial importance, since to such, more than any other, must be ascribed the persistence of the disease in sporadic form in communities where every precaution is taken to insure a pure water-supply. This fact was most clearly established by the investigations carried on in 1902 in Alsace and Lorraine, where typhoid fever was notoriously in evidence in spite of the utmost effort to control the disease by the ordinary sanitary methods. The conclusions arrived at in the course of those studies have been verified and extended by workers in all parts of the world. The occurrence of typhoid and para-typhoid bacilli in healthy and chronic carriers can hardly be advanced as an argument against the accepted pathogenic rôle of these organisms. The lesson taught by the history of yellow fever and hog cholera might lead us to believe that the above-mentioned organisms were accidental and not causative, and that the real cause might be of an ultra-microscopic character. No experimental evidence, however, has yet been presented in support of this idea. On the contrary, all the known facts, especially the serum reactions, and above all, the remarkable results obtained in the prevention of typhoid fever by inoculation of the dead bacillus point to the etiologic significance of the typhoid germ.

The number of chronic typhoid carriers is not large, being placed by various workers at from 2 to 3 to 5 per cent.; figures which can not be considered as exact in view of the known imperfections of the methods employed. This low percentage, however, is an encouraging and redeeming feature when one considers that the excretion of the typhoid bacillus by such carriers is not always limited to weeks or months, but may continue for years and perhaps till death. This remarkable persistence of the germ is commonly considered to be due to its localization in, and adaptation to the biliary passages. Its presence in the bile and in biliary calculi is an established fact. Usually, with the bile the organism passes into the intestine to be eliminated with the discharges; less often it enters the circulation and appears in the urine. The fact that the bile is a common avenue of elimination when organisms are introduced into the blood may lead one to suppose that the bacillus is primarily localized elsewhere than in the bile bladder, and such a supposition is not without analogy. A vegetative focus within an organ not only explains the presence of the bacillus in the bile and, at times, in the urine, but also accounts for the fact that in others the

elimination is of an intermittent character.

The result of studies on the age and sex distribution of carriers indicates that children are the least, while women are most prone to this condition. The latter fact is noteworthy, since the spread of typhoid fever by carriers engaged in the handling of and preparation of food must be considered as beyond question. The figures which we have showing the relative frequency of infection through such carriers vary considerably, owing to the necessarily different conditions prevailing in different regions. Generally speaking, from 4 to 30 per cent. of the cases of typhoid fever are traceable to the chronic carrier. In localized outbreaks, such as arise in the family, the boarding house, and the like, practically every case may have this origin.

Essentially the same facts which have been developed in connection with diphtheria and typhoid fever hold true for other diseases, such as influenza, meningitis, pneumonic plague, dysentery and cholera. In the matter of cholera it may not be without interest to note that one of the most effective means employed during the past summer to prevent the introduction of cholera into this country was the systematic examination of all third-class passengers coming from infected ports for cholera carriers.

By far the most interesting and instructive example of a disease carrier is that revealed in connection with Malta fever. The cause of this disease, the *Micrococcus melitensis,* has been known for twenty-five years, but the real mode of transmission of the disease was not recognized until five years ago. It was then shown for the first time, and quite accidentally, that the goat is really a chronic carrier of the disease organism. The studies of the British Commission showed that among the many thousand of goats examined on the Island of Malta, fully 50 per cent. gave the agglutination test, while 10 per cent. were actually secreting the micrococcus in their milk. The existence of the disease among goats was wholly unexpected, but its existence forcibly taught a lesson on the importance of the chronic carrier.

The disease in the goat was so mild as to pass unnoticed. On recovery, however, the specific germ instead of disappearing became localized in the mammary gland and hence appeared in the milk. The use of this milk by man led to his infection with Malta fever. The recognition that this disease was a milk infection enabled the authorities, once and for all, to put an end to the tribute paid by the British army and navy. The simplest precaution, the boiling of the goat's milk or its avoidance, was sufficient to put an end to the scourge.

In many ways Malta fever in man presents a striking analogy to typhoid fever. In both diseases the specific organism persists in the body during convalescence and indeed after full recovery. Their continued elimination in the urine and discharges indicates a localization in some part of the body. In both infection occurs by way of the alimentary tract.

Carriers are by no means restricted to the bacterial diseases, of which but a few have been discussed. They play an even more important part in the propagation of certain protozoal infections. They constitute the natural reservoirs of virus and, as such, are chiefly responsible for the continued existence of these diseases. Thus, cattle which have recovered from Texas fever do not show, on microscopical examination of their blood, any evidence of the presence of the parasite, and yet such blood injected into a healthy animal gives rise to the typical disease. The parasite is clearly present, either in extremely small numbers, or, what is more likely, in an unrecog-

nizable form in the immune animal. The condition is analogous to that observed in the chronic carriers of typhoid fever and other bacterial diseases; it implies that a reciprocal immunity has been established, an armed truce so to speak, between the host and invader.

In trypanosomal disease chronic carriers are equally in evidence. When recovery occurs, as it does in some animals, the organism, though present in the blood, is practically unrecognizable by means other than inoculation of animals or by artificial cultivation. The culture method had revealed the presence of such trypanosomes in a large percentage of birds, and more recently the same procedure has demonstrated the existence of similar parasites in the cattle of various countries.

The disease caused by sub-microscopic or invisible organisms may show this same persistence of the infective agent long after recovery has taken place. A striking example of this fact has but recently been determined in connection with infantile paralysis where the virus has been found to persist in the naso-pharynx for many months. The existence of the chronic carrier being recognized, it is no longer surprising to learn of sudden outbreaks of this dangerous disease, apparently spontaneous in character, in a locality where no previous case was known to exist.

INVERTEBRATE CARRIERS

Important as the vertebrate carrier may be, it is quite overshadowed by the enormous importance of the invertebrate carrier. It may be asserted without fear of contradiction that the most valuable results which have been accomplished in preventive medicine in recent years have come from the recognition of the exclusive rôle played by these carriers in the transmission of many diseases. Texas fever, malaria, yellow fever, sleeping sickness, not to mention a score of other infections, find their natural transmission in the agency of insects, ticks and other sanguivorous organisms.

It has been customary for some years to speak of insects as *passive* and as *active carriers,* which terms convey certain well-defined conceptions. The passive carrier is an accidental conveyer rather than a natural host for the germ. A fly feeding upon typhoid excreta may soil its feet or proboscis and on alighting elsewhere may deposit such mechanically adhering particles. The part played by the passive carrier is merely one of indirect contamination—a purely mechanical transmission of the infective agent from one place to another. This transference of disease organisms to articles of food, or even into wounds by flying insects may lead to infection, and, in fact, it is generally recognized that certain bacterial and even protozoal diseases may thus be spread. Cholera, dysentery, tuberculosis and typhoid fever are most often mentioned in this connection.

The active carrier, on the other hand, is essentially a diseased individual and corresponds in a way to the chronic vertebrate carrier already discussed. Some, however, can be compared more correctly to the healthy carriers. The insect, tick, leech, and the like, which feed upon an infected animal may become a suitable soil for the disease organism, which either multiplies directly, or else passes through a developmental cycle in its new host. It has been supposed by some that active carriers can harbor only animal parasites, such as the pathogenic protozoa and filaria, an assumption which is quite erroneous. It is undoubtedly true that many of the known active carriers do transmit animal parasites, but that fact is not sufficient to exclude a like transmission of bacteria, nor

does it justify the assumption, so freely resorted to, that an unseen and unrecognizable germ which is transmitted by an active carrier is *ipso facto* a protozoon.

The best example of an insect bacillus carrier is seen in bubonic plague, which is spread almost wholly by the bites of fleas which come from naturally infected rats or other rodents. The plague bacillus is present in the blood of the diseased animal, usually some hours before death, and the flea which sucks up such blood into its stomach becomes infected with a variable number of the organisms. These then undergo multiplication in the digestive tube, and persist therein for four to ten to twenty-one days, depending upon the temperature, method of feeding, and perhaps on factors inherent in the flea itself. There is no evidence that the flea is affected in any way by the presence of the bacillus, which leaves the body chiefly, if not entirely, along with the feces. The contact of this excretal matter with the wound is perhaps the chief means by which infection occurs. It is clear, therefore, that the flea is not a mere passive carrier, but an actual host (a healthy carrier), even though the parasite is unable to maintain a very prolonged existence within its digestive tube.

The common rat flea is also one of the agents which brings about the transmission of a protozoal disease among rats, namely, *Trypanosoma Lewisi*. Opinions have differed as to the part played by the flea in the transmission of this infection; as to whether it was a mere passive, or a real active carrier. But recent studies have shown clearly that passive transmission, in this as in other trypanosomatic diseases, though possible, is of no special consequence; and, that the flea is a true host, an active carrier. The work of Minchin and Thomson indicates the existence of an intracellular multiplication of the parasite in the epithelial cells of the mid-gut, as a result of which the trypanosome breaks up into a number, possibly eight, daughter trypanosomes, which then become free and undergo further development and multiplication. The period of incubation is six to seven days or more, but the insect once infected remains so for an indefinite period. Regurgitation of the ripe infective form from the stomach of the flea into the wound made by the proboscis of the flea is, according to these investigators, the normal method of transmission.

Incidentally it may be stated that evidence has been presented, though it can not be said to be conclusive, which goes to show that the dog flea is responsible for the spread of the disease known as infantile kala-azar. Further investigation is needed to determine the mode of transmission of this deadly infection.

The tick family is an extremely important group as regards the transmission of disease of man and animals. The infective agent may be a bacillus, a spirochete; or a typical protozoon such as a piroplasm or a trypanosome. For example, we know from the splendid studies of Ricketts on the so-called Rocky Mountain fever, also known as "spotted" or "tick" fever, that this disease is due in all probability to a bacillus, and, furthermore, that this is invariably transmitted by the bite of a tick, or of its offspring.

The spirochetes which many workers, following the lead of Schaudinn, believed to be protozoa are now rarely classed as such even by zoologists. Instead, they have either been turned back among the spiral bacteria, or have been given a separate position, intermediate between them and the protozoa. This fact is of interest because most of the spirochetal diseases are transmitted through the agency of active carriers, such as the louse and especially ticks. The best

example of the latter type of infection is the African tick fever, which is closely identified with the ordinary relapsing fever. The active carrier in this case is the tick, *Ornithodorus moubata*, which not only can transmit the disease directly, but can also do so through its offspring. A spirochetal disease of chicken is similarly transmitted by another tick, *Argas miniatus*.

Our knowledge regarding the change which the spirochete undergoes in the tick and in the egg is by no means complete. Thus, while some workers, such as Koch, described the presence of the spiral organism in the internal organs and in the eggs, other observers have failed to demonstrate their presence. Leishman, a most careful worker, was, as a rule, unable to detect recognizable spirochetes later than the tenth day after ingestion by the ticks. Instead he observed clumps of chromatin granules which were also invariably present in the eggs, larvæ and nymphs derived from infected ticks. The spirochete origin of these granules is uncertain, especially since similar granules were found in nymphs derived from ticks fed on normal blood.

The infection of a healthy animal by a tick may occur, either by the injection of spirochetes with the salivary secretion, or by regurgitation of infective material from the gut, but neither of these modes of infection can be considered as common. Instead, it appears from the work of Leishman and of Hindle, that infection is the result of excretion of infective material from the Malpighian tubules and gut, which enters the open wound caused by the tick's bite. This contaminative wound infection is therefore similar to that already noted in connection with the flea and bubonic plague.

The Texas fever of cattle, as is well known, was the first disease in which transmission through the agency of an insect or arthropod was demonstrated. The facts presented by Smith and Kilborne twenty years ago hold to-day. Thanks to that work which served to open up the entire field of invertebrate carriers, we know that the disease is not transferred directly by the tick which has fed upon an infected animal, but indirectly through the young ticks which hatch from its eggs. The pathogenic agent in this case is a typical intracellular protozoon, the *Piroplasma*. Similar piroplasmatic diseases are met with in a variety of domestic animals and, in all such cases, transmission is effected by ticks at one stage or another of their development.

In addition to the foregoing types of organisms which are transmitted by ticks, passing mention may be made of the common trypanosome infection of cattle, already referred to, which in all probability owes its presence to this group of ectoparasites.

The recognition of mosquito-borne diseases marks one of the most important advances in modern times. Thanks to the work of Ross, Grassi and many others, we learned that malaria was transmitted solely through the bite of the mosquito. The life history of the parasite in the *Anopheles* has been traced, most completely, from the moment when it enters the stomach with the ingested blood, until it leaves the insect by way of the salivary secretion.

Barely a decade has passed since yellow fever was shown by Reed and his co-workers to be similarly transmitted, though by another genus of mosquito, the *Stegomyia*. The cause of the disease escaped their search, and for that matter is still unknown, but the practical results which followed from their work culminated in the

complete conquest of a hitherto uncontrolled scourge.

Did time permit, some consideration could be given to insect carriers, such as the body louse, which has to do with the transmission of relapsing fever and typhus fever in man, and the trypanosome infection in the common rat; the bed-bug, which has often attracted attention in connection with plague, relapsing fever and kala-azar; and to the sand-fly, which has recently been shown to be responsible for the pappataci fever, which is due, like dengue and yellow fever, to a filterable, invisible virus. It will be better to pass these by and consider briefly a vastly more important carrier, the tsetse fly.

Curiously enough, the tsetse-fly disease of South Africa was the first disease clearly recognized as insect-borne. The natives, as well as the early travelers, realized that the bite of the tsetse fly caused sickness and death of the animals thus bitten. The work of Bruce in 1894 proved this relation and at the same time demonstrated that the disease was due to a blood parasite, since named, *Tr. Brucei.* At that time Bruce was led to believe that the fly was infective for but a few hours, or at most a day or two after an infective feed. In other words, the fly was thought to be a passive carrier, simply carrying the parasite from one animal to another. This view has been definitely set aside as a result of the studies of the past two years. Mechanical transmission, especially where interrupted feeding occurs, is possible, but that this is the natural way is no longer believed. That the tsetse fly obtained its infection from the wild animals was a reasonable supposition, which was soon confirmed by special examinations. The important fact was established that the wild animal, recovering from the infection, became a chronic carrier and as such served as a natural reservoir of the virus. As long as such wild animals existed, the fly could infect itself and transmit the disease to the passing domestic animal. The introduction of rinderpest into South Africa is said to have brought about the destruction of wild animals to such an extent as to render this disease a negligible quantity in that region.

Especial interest centers about the tsetse fly because of its relation to sleeping sickness, which is caused by the *Trypanosoma gambiense.* While the fly, *Glossina palpalis,* is chiefly responsible for the spread of this disease, there is reason to believe that other species of tsetse flies can likewise serve as carriers. Attempts to eradicate the disease by removing all of the natives from certain regions have failed to accomplish the desired result. The tsetses undoubtedly obtain their infection from some other source than diseased man. This natural reservoir of the virus has not as yet been discovered, although from experiments made on antelopes it is not unlikely that these or related animals constitute the chronic carrier from which the infection is transmitted to man by the fly.

The question as to whether the tsetse fly could act as an active carrier was finally settled by Kleine (1909) and confirmed by Bruce and his co-workers. It is now known that flies which feed upon infected animals remain harmless for a period of about three weeks. After that time, however, they become infective and apparently remain so during the remainder of their life. Only a small percentage of the flies thus fed become infected. The changes which the trypanosome undergoes in the fly are but partly known. Whether this parasite has an intracellular stage, such as has been observed in fleas infected with *Tr. Lewisi,* remains to be demonstrated. It is certain, however, that *Tr. gambiense,* when it once adapts itself to the conditions in

the digestive tube of the fly, then multiplies in much the same way as it would in the culture tube. It is an interesting fact that when blood containing *Tr. brucei* is planted on a suitable culture medium an incubation period of from two to three weeks is necessary to bring about this adaptation. It is not unreasonable to believe that the changes which take place in the test-tube are not unlike those which occur within the digestive tube of the fly. The successful cultivation of *Tr. gambiense* has not as yet been realized and hence comparison of the two can not be made.

Frederick G. Novy
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CONCERNING NOMINA CONSERVANDA, AND A REFERENDUM TO ALL ZOOLOGISTS

The *Zoologischer Anzeiger* for January 3, 1912, publishes the result of an extensive mail vote taken among the professional zoologists of Denmark, Finland, Norway and Sweden, for and against the strict application of the law of priority in all cases, the negative vote expressing the desire that the most important and generally used names should be protected against any change on nomenclatural grounds. The vote was taken among professional zoologists, excluding anatomists, paleontologists and amateurs. Dr. Th. Mortensen, in reporting the results, comments as follows:

> The result of the vote is very striking. Of the 122 names there are two for the strict application of the priority rule in all cases, which means less than two per cent. It may perhaps not be unreasonable to conclude from this result that the number of those zoologists who swear to the strict application of the priority rule, is upon the whole very small, the great majority wishing to have the names preserved unaltered.
>
> It is to be hoped that the zoologists of other countries will follow the example given here. When this has been done and it has been definitely proved that the great majority object to the strict application of the priority rule, it may perhaps be expected that the tyranny of that notorious law, which has already done so much to damage science, will be thrown off.

The Entomological News for March, 1912, in an editorial on this subject offers to receive and print the names of any American zoologists who will send in their votes.[1] It is to be hoped that all zoologists of this country interested in the names of animals will register their votes as suggested.

Any general concurrence in the protest against the strict application of the law of priority in all cases should not be accepted as a licence for every zoologist to adopt any names that he chooses. No individual should take it upon himself to waive the rules, but in specific cases where clearly greater convenience will result from setting them aside, this should be done by such a centrally organized and authorized body as the Commission on Zoological Nomenclature. Such a body should work toward the compilation of a list of *nomina conservanda,* and the names of such a list, once adopted by the International Congress, should never be open to future change on nomenclatural grounds.

The adoption of a list of *nomina conservanda* is not without precedent. The botanists have such a list, and it appears to work well. Article 20 of the International Rules of Botanical Nomenclature reads:

> However, to avoid disadvantageous changes in the nomenclature of genera by the strict application of the rules of nomenclature, and especially of the principle of priority in starting from 1753, the rules provide a list of names which must be retained in all cases. These names are by preference those which have come into general use in the fifty years following their publication, or which have been used in monographs and important floristic works up to the year 1890. The list of these names forms an appendix to the rules of nomenclature.

The next meeting of the International Zoological Congress will occur in July, 1913, and any proposed change in the rules of nomenclature must be forwarded to the commission a year in advance of the meeting at which

[1] To Dr. P. P. Calvert, editor, 4515 Regent St., Philadelphia, Pa.

they are to be considered. Therefore, in order to bring the question of *nomina conservanda* before the next International Congress, we, the undersigned, have drawn up and forwarded to the secretary of the International Commission, Dr. Ch. W. Stiles, Washington, D. C., the following proposal:

PROPOSED AMENDMENT TO THE INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE

To add to Article 26.

To avoid disadvantageous changes in the nomenclature of genera by the strict application of the rules of nomenclature, and especially of the principle of priority, the International Commission on Zoological Nomenclature is empowered to prepare a list of names to be retained. These names are to be by preference those which have come into general use in the fifty years following their publication, especially those generic names upon which long used family names are based and those which have been used in monographs and important works up to the year 1890. With each generic name thus conserved is to be cited a type species, to be chosen with a view to retaining the name in its most widely known sense, even if thereby an exception must be made to the other provisions of this code.

We beg leave to suggest to American zoologists individually and to zoological societies the need that the commission be fully informed as to the state of opinion among us concerning the substance of this proposal. The commission has in times past published an invitation to all zoologists to send in proposed lists of *nomina conservanda,* and has met with little response. This was doubtless due to the form of the invitation, the data called for being far more than any of us had time to compile. It will require little effort to write a postcard to the secretary of the commission, expressing approval or disapproval of plan proposed; it will be easier still to vote "yes" or "no" to a question prepared for circulation among the members of any society having zoological interests. It is urged that in all zoological societies, such an inquiry be circulated for personal signature, and that the result of the vote be forwarded to the commission and also published in the scientific press. We entertain a hope that the real opinion of zoologists may thus find expression, and that such expression may so influence future rule-making as to prevent the unspeakable confusion of our literature that already impends.

(Signed)

J. C. BRADLEY
J. H. COMSTOCK
J. G. NEEDHAM
H. D. REED
W. A. RILEY
ANNA H. MORGAN
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C. R. CROSBY
A. H. WRIGHT
R. MATHESON
G. C. EMBODY

THE RAINEY AFRICAN COLLECTION

THE final shipment of the extensive natural history collection made by the Paul J. Rainey expedition in British East Africa, numbering some fourteen barrels and thirteen cases, has been received at the U. S. National Museum, and is being unpacked in the taxidermy shops. The collection is of large size, including some 4,000 specimens, more than 700 of which are those of large game.

Mr. Edmund Heller has been the guest of Mr. Paul J. Rainey on his African hunting trip, and accompanied the expedition for the purpose of preserving the animals secured. Mr. Rainey has donated the entire collection to the Smithsonian Institution and the National Museum. While Mr. Heller had charge of the preservation of mammals in general, he paid special attention to collecting carnivores and ungulates. In a Smithsonian publication, now in press, Mr. Heller describes twenty-four new species of African rodents found in the collection. During the trip Mr. Rainey granted Mr. Heller every opportunity to make a complete survey of mammals. His assistants, twenty or thirty trained negro skinners, porters, etc., were employed by the safari.

Among the material obtained is the series of lions captured by Mr. Rainey's American bear-hounds, as described in his well-known lectures. There are also many specimens of different kinds of antelopes, including the hartebeestes, wildebeestes and waterbucks, as well as buffaloes, zebras, cheetahs, monkeys and rodents. A few hippo skulls and rhino

skins and one elephant were also collected. A large number of birds was secured, including some of the rarest species. Many are game birds, among them guinea-fowls and francolins (which resemble our partridges), and plantain-eaters, crows, bustards, vultures, vulturine guinea-fowl, owls, hawks, kites, secretary birds, horn-bills, pigeons, parrots, sun-birds, flycatchers, etc., are represented. There are also four ostrich eggs.

The party remained in the field nearly a year, having sailed from New York for Mombasa on February 18, 1911, not dispersing until about February 15, 1912, at Nairobi. The territory traversed was mostly to the north and east of that covered by Colonel Roosevelt on the earlier Smithsonian expedition, and included the country lying between the northern part of British East Africa and southern Abyssinia.

THE TWELFTH INTERNATIONAL GEOLOGICAL CONGRESS

The International Geological Congress, on the joint invitation of the government of Canada, the provincial governments, the Department of Mines and the Canadian Mining Institute, will hold its twelfth meeting in Canada during the summer of 1913. It is proposed to hold the meeting in Toronto, beginning on or about the twenty-first day of August. The congress will continue in session for eight days.

The following topics have been selected by the executive committee as the principal subjects for discussion:

1. The coal resources of the world.
2. Differentiation in igneous magmas.
3. The influence of depth on the character of metaliferous deposits.
4. The origin and extent of the pre-Cambrian sedimentaries.
5. The subdivisions, correlation and terminology of the pre-Cambrian.
6. To what extent was the Ice Age broken by interglacial periods?
7. The physical and faunal characteristics of the Paleozoic seas with reference to the value of the recurrence of seas in establishing geologic systems.

The executive committee of the Eleventh Congress, held in Sweden, compiled and published a comprehensive report on the Iron Ore Resources of the World. The present executive committee has undertaken the preparation of a similar monograph on the Coal Resources of the World. In order to make the work as complete as possible the cooperation of all the principal countries of the world has been invited. This invitation has met with a cordial response, and it is hoped the volumes will be ready for distribution before the meeting so that they may constitute a basis for discussion at the congress.

Arrangements have been made for a series of excursions before, during and after the congress which will enable the members to gain a knowledge of the geology and physiography as well as the mineral resources of Canada.

The honorary president of the congress is the Duke of Connaught, governor general of the Dominion of Canada. The president is Dr. Frank D. Adams, dean of the faculty of applied science and Logan professor of geology, McGill University, Montreal, and the general secretary is Mr. R. W. Brock, director of the Geological Survey of Canada.

SCIENTIFIC NOTES AND NEWS

At the celebration of the seventy-fifth anniversary of the foundation of the University of Michigan on June 27, the degree of doctor of laws was conferred on Dr. Henry S. Carhart, professor of physics there from 1886 until his retirement in 1909 as emeritus professor. As already noted in Science, the degree of doctor of science has been conferred on Dr. Carhart by Northwestern University, where he was professor of physics from 1872 to 1886.

Yale University has conferred the degree of doctor of science on Professor H. T. Eddy, dean of the graduate school of the University of Minnesota. Professor Eddy, who is president of Sigma Xi, gave one of the addresses of the joint meeting of the members of the societies of Phi Beta Kappa and Sigma Xi.

THE University of Pittsburgh has conferred the degree of doctor of laws on President E. F. Nichols, president of Dartmouth College, and on Dr. Charles D. Walcott, secretary of the Smithsonian Institution.

DR. LEWIS BOSS, director of Dudley Observatory, has received the doctorate of science from Dartmouth College.

THE University of Colorado conferred the degree of doctor of laws on Dr. Florian Cajori, professor of mathematics in Colorado College.

THE Royal Society of Edinburgh has awarded to Professor Alexander Smith, professor of chemistry in Columbia University, the Keith Prize for the biennial period 1909–1911. The award is made for his researches upon sulphur and upon vapor pressure, which have been published in the *Journal* of the American Chemical Society.

THE Franklin Institute of Philadelphia, Pa., has awarded the Edward Longstreth medal of merit and diploma to Dr. Charles Baskerville, professor of chemistry and director of the laboratory at the College of the City of New York, for his investigations on the chemistry of anesthetics (ethyl ether, chloroform, nitrous oxide and oxygen).

ACCORDING to *Nature* the list of honors on the occasion of King George's birthday, which was celebrated on June 14, includes the name of only one fellow of the Royal Society, Lieut.-Col. D. Prain, director of the Royal Gardens, Kew, who has been knighted. Among others upon whom a like honor has been conferred are Mr. R. G. A. Moynihan, professor of clinical surgery at the University of Leeds; Mr. C. H. Read, president of the Society of Antiquaries; Mr. J. Bland Sutton, the distinguished surgeon; Dr. St. Clair Thomson, professor of laryngology and diseases of the throat at King's College Hospital. Another honored member of the medical profession is Mr. R. J. Godlee, president of the Royal College of Surgeons, who has been created a baronet. The Companions of the Order of St. Michael and St. George (C.M.G.) include Dr. A. Balfour, director of the Government Research Laboratory, Gordon Memorial College, Khartoum; Mr. J. Currie, principal of the same college, and Mr. J. M. Macoun, assistant botanist and naturalist, Canadian Geological Survey. Dr. G. A. Grierson and Dr. M. A. Stein have been appointed Knight Commanders of the Order of the Indian Empire (K.C.I.E.), and among the new Companions of the same Order (C.I.E) are Mr. B. Coventry, director of the Indian Agricultural Research Institute; Mr. A. Chatterton, superintendent of industrial education, Madras, and Dr. P. C. Ray, professor of chemistry, Presidency College, Calcutta.

DR. C. J. MARTIN, F.R.S., director of the Lister Institute of Preventive Medicine, London, has been elected an honorary member of the Royal Society of New South Wales.

DR. W. W. CAMPBELL, director of the Lick Observatory, expects to visit the D. O. Mills Observatory at Santiago, Chili, which is under his charge. Mr. Ogden Mills will continue to maintain the observatory for 1913 and 1914.

DR. CHARLES D. WALCOTT, secretary of the Smithsonian Institution, has left Washington for British Columbia, where he will continue his studies in Cambrian geology and paleontology.

DR. SIMON FLEXNER, director of the laboratories of the Rockefeller Institute for Medical Research, who went abroad last February to give lectures at the Edinburgh University and the Royal Institute of Public Health, London, has returned to New York.

DR. G. PATTERSON, JR., assistant professor of chemistry in the University of Notre Dame, has accepted a position with the government of the Republic of Panama and will sail from New York to take charge of his duties some time this summer.

MR. HOWLAND BANCROFT has resigned from the U. S. Geological Survey, with which he has been connected since 1907, and will enter practise as a consulting mining geologist.

DR. F. E. LLOYD, professor elect of botany in McGill University, will spend a portion of the summer at the Carnegie Institution of Wash-

ington Botanical Laboratories at Carmel, Cal., and Tucson, Ariz., continuing his investigations of transpiration in cotton and other, chiefly halophytic, plants.

Mr. N. Banks, Bureau of Entomology, has gone to Europe to spend a few months studying in various museums.

At the Worcester Polytechnic Institute a fund has been established to be called the Leonard P. Kinnicutt Student Loan Fund, with certain sums of money left after the discontinuance of Newton Hall, for eight years the institute dormitory on State St. Dr. Kinnicutt, while professor of chemistry, was chairman of the faculty committee in charge of the dormitory, and was always active in helping students financially and in other ways.

A memorial service in honor of Robert Koch was recently held in a temple dedicated to him, which has been erected at Tokyo. The temple owes its origin to the interest of Professor Kitasato.

We learn from *Nature* that Lady Hooker will be grateful if any of her friends who possess letters written by her late husband, Sir Joseph Hooker, will lend them to her for the purposes of a biography which Messrs. Smith, Elder and Co. will publish. The letters, which should be forwarded to Lady Hooker at The Camp, Sunningdale, will be carefully returned.

The death occurred on June 13 of Dr. Shadworth H. Hodgson, the eminent British philosopher, at the age of seventy-nine years.

M. F. Lecoq de Bois-Baudran, the French chemist, has died at the age of seventy-four years. The Davy medal of the Royal Society was awarded to him in 1879, for the discovery of gallium.

Dr. Karl von der Mühll, professor of mathematical physics at Bâsle, has died at the age of seventy-one years.

M. C. André, director of the Lyons Observatory, has died at seventy-two years of age.

The death is also announced of Professor H. F. Weber, director of the Physical Electrotechnical Institute at Zurich, aged sixty-nine years.

The twenty-third annual conference of the Museums Association will be held in Dublin on July 8–12, under the presidency of Count G. N. Plunkett, director of the National Museum of Ireland.

The program for the meeting of the British Association at Dundee on September 4 and following days includes garden parties at Glamis Castle, Kinfauns Castle, Rossie Priory and Camperdown and excursions to St. Andrews, Dunfermline, Arbroath and Aviemore. The president, Dr. Schäfer, of Edinburgh University, will devote his address to the developments that have taken place during the last 50 years through the study of the tissues of the body by means of the microscope. Professor Bragg will discourse on "Radiations, Old and New," and Professor Keith on "The Antiquity of Man." The lord provost, magistrates and citizens of Dundee are cooperating with the officials of the association for the entertainment of the visitors. A hand-book on the city and its industries is in preparation.

The plan of Professor Willis L. Moore, chief of the United States Weather Bureau, for the establishment of an international North Atlantic weather service has been agreed to by the committee of the Radio Telegraph Congress meeting at London. According to the plan as outlined by Professor Moore, a median line will be established through the North Atlantic. All ships on either side of the line must take a daily weather observation which will be sent by wireless telegraphy to other vessels and thus relayed to the American or European land stations. From these reports weather charts will be constructed and forwarded to the shipping at sea.

Professor W. H. Perkin has read a paper before the Society of Chemical Industry, announcing that rubber has been synthesized, and that this synthetic rubber can be placed on the market at a price to compete with plantation rubber. According to the account

in *Nature* it was reported that Professor Fernbach, of the Pasteur Institute, was, after eighteen months of laborious work, able to produce a fermentation process for the production of fusel oil from any starchy material. The process is now so satisfactory that the higher alcohols can be obtained at a cost of not more than £30 per ton. Having produced isoprene cheaply, the next consideration was how to polymerize it and convert it into rubber satisfactorily. The discovery of the cheap method for preparing isoprene was first suggested by Dr. Matthews. In 1909 Mr. E. Halford Strange, of Messrs. Strange and Graham, technical research chemists, directed his organization of chemists, headed by Dr. Matthews, to the problem of the synthetic production of rubber. Dr. F. E. Matthews suggested one method for preparing isoprene in which acetone was one of the raw materials, and later on one in which fusel oil was the starting product. Professor Perkin was then asked to cooperate, and later on Sir William Ramsay joined the group as consultant. In July, 1910, Dr. Matthews left some metallic sodium in contact with isoprene, and on returning from his holidays in September found that the isoprene had turned into a solid mass of rubber. On further investigation it was found that sodium is a general polymerizing agent for this class of material. The first announcement of this discovery was made by Professor Carl Harries, of Germany, who had made the same discovery independently, about three months later.

PRESIDENT TAFT has just made considerable changes in the National Forests in Montana, Arizona, Nevada, Utah and California through presidential proclamations modifying the boundary lines. By these changes nearly 275,000 acres of land are eliminated from the forests, about 65,000 acres are added, and about 55,000 acres are transferred between two forests, while a new forest is created by the division of an old unit into two. The net result is to bring down the total gross area of the national forests to about 187,400,000 acres, of which nearly 27,000,000 acres are in Alaska. To a considerable extent, however, the reductions, so far as land actually owned by the government is concerned, are apparent rather than real, owing to heavy alienations in the tracts eliminated. Some 22,000,000 acres of the national forest gross area are not owned by the government. The high-water mark of the national forest gross area was reached in 1909, when the forest boundaries included over 194,000,000 acres. It was then realized, however, that in making the examinations on which the presidential proclamations creating the forests were based the work had been too rapid to insure in all cases the best boundaries. Sometimes land which should have been included was left out, while at other times land was taken in which was not best suited to forest purposes. Consequently a complete overhauling and rectification of the forest boundaries was planned, and has been going on ever since. By successive proclamations President Taft has eliminated nearly 11,000,000 acres, while he has added about 4,000,000 acres. In Montana, the new proclamations eliminate a total of 116,370 acres from six forests—the Custer, Absaroka, Blackfeet, Kootenai, Lewis and Clark and Flathead—while 14,640 acres are transferred from the Blackfeet to the Kootenai and 40,640 from the Kootenai to the Blackfeet, to facilitate administration. In Arizona, 106,540 acres are eliminated from the Coronado National Forest. In Nevada, 49,840 acres are eliminated from the Humboldt and 55,840 acres added, of which 12,800 acres are included in the new Ruby National Forest, composed principally of that part of the old Humboldt lying south of the Southern Pacific Railroad. In Utah, 1,340 acres are eliminated from the Sevier, while in California 8,680 acres are added to the Shasta and 480 acres to the Klamath.

UNIVERSITY AND EDUCATIONAL NEWS

THE income of the Henry O. and Mary A. F. Hotchkiss bequest, which will eventually revert to the Sheffield Scientific School of Yale University, is to be apportioned for the purpose of adding to the salaries of those who

are employed as the principal professors, instructors or lecturers having severally the charge of the following subjects: mathematics, English, physiological chemistry, electrical engineering, architecture, mining engineering, metallurgy, mechanical engineering, history and sociology and commercial geography. It is understood that the estate will be between $500,000 and $600,000.

The sum of $25,000 as the nucleus of an endowment fund to increase the salaries of professors has been willed to the University of Pennsylvania by Mrs. Elizabeth Wharton McKean.

Brown University has completed the collection of an additional endowment fund of $1,000,000 from some twenty-five hundred donors. This is the third fund of this amount collected under the administration of President Faunce.

Announcement of plans for new building operations at the University of Chicago, to involve approximately $1,000,000, was made by President Judson at the eighty-third convocation. The new buildings, which are to be begun at once, and to be completed within two years, are: a building for the departments of geology and geography to cost about $300,000; a gymnasium for women, to cost approximately the same sum, and a building to house the classical departments and their departmental libraries, to cost $225,000. In addition, the widely known Marshall Field, on which take place the football and athletic contests, and which adjoins the great Bartlett Gymnasium, is to have grandstands built of cement, and is to be surrounded by a concrete wall.

The Sloane Laboratory of Physics of Yale University was dedicated as part of the commencement exercises. A brief address was made by President Hadley. Messrs. Henry T. Sloane and Wm. B. Sloane, of New York City, who provided more than half a million dollars for the erection of the laboratory, were present.

Professor Arthur Michael, formerly of Tufts College, and Professor Elmer P. Kohler, of Bryn Mawr College, have been appointed professors of chemistry in Harvard University. Both will direct research in organic chemistry, and Professor Kohler will also conduct the chief undergraduate course in this subject and assume the charge of the introductory course in chemistry intended for those who have not pursued the subject in school. Professor Arthur B. Lamb, whose appointment as assistant professor has already been announced, will give another elementary course in inorganic chemistry (for those who have passed the admission examination in a satisfactory manner) and also conduct advanced instruction in electrochemistry. A further addition to the department of chemistry at Harvard is that of Dr. Grinnell Jones, of the University of Illinois, who has been appointed instructor.

Dr. Clark A. Hamann, professor of applied anatomy and clinical surgery, has been appointed dean of the medical department of Western Reserve University in succession to Dr. B. L. Millikan. Dr. Howard B. Haskins has been promoted to be associate professor of organic chemistry, and Dr. David Marine to be assistant professor of experimental medicine, and John S. Davidson to be associate in anatomy. Mr. Ralph J. Gilmore has been appointed instructor in biology.

At Brown University, Dr. Alfred H. Jones, of Cornell University, has been appointed professor of philosophy to succeed Dr. Alexander Meiklejohn, elected to the presidency of Amherst College. Mr. Alfred C. Hawkins has been appointed instructor in geology. Promotions include: William H. Kenerson, associate professor of mechanical engineering, to become professor; Roland G. D. Richardson, assistant professor of pure mathematics, to become associate professor; James A. Hall, assistant in mechanical engineering, to become instructor.

At the Worcester Polytechnic Institute Dr. Levi L. Conant, professor of mathematics, has been continued by the trustees as acting president. To relieve Professor Conant, Dr. Raymond K. Morley, now of the University of Illinois, has been appointed assistant professor of mathematics. John Harlan Nel-

son, of the Case School of Applied Science, has been appointed head of the department of applied mechanics, to fill the place vacant by the death of Professor E. L. Hancock; H. S. Ives has been promoted to be professor of railroad engineering; Dr. A. W. Hull, to be assistant professor of physics, and T. R. Briggs has been appointed instructor in chemistry.

WALTER FENNO DEARBORN, Ph.D. (Columbia), recently professor in the school of education of the University of Chicago, has been appointed assistant professor of education at Harvard University.

DR. HARLAN UPDEGRAFF, specialist in school administration, United States Bureau of Education, has been appointed professor of education and head of that department in Northwestern University.

MR. JAMES KNOX TAYLOR, supervising architect of the treasury department, has been elected professor of architecture in the Massachusetts Institute of Technology.

DR. R. F. BAUNEL, of the department of chemistry of Syracuse University, has accepted an appointment as associate professor of organic chemistry at Bryn Mawr.

THE board of trustees of Jefferson Medical College has elected to the chair of chemistry, made vacant by the resignation of Dr. James W. Holland, Professor Philip B. Hawk, of the University of Illinois.

MR. H. T. PLUMMER, assistant at the Oxford University Observatory, has been appointed Andrews professor of astronomy at Dublin University and astronomer royal of Ireland, as successor to Professor E. T. Whittaker, who has been called to Edinburgh University to the chair of mathematics vacant by the death of Professor Chrystal.

DISCUSSION AND CORRESPONDENCE

PRIORITY VS. NOMINA CONSERVANDA

WE all agree that nomenclature is a means, not an end, and should be of service alike to general or special workers in other lines as well as to the student of a restricted group. We must also admit the human element, the personal equation, which is an important factor in applying the law of priority as well as in the selection of *nomina conservanda*—mistakes may be made in either case. It can hardly better matters to defer the correction of an error till some central representative body (usually with no special knowledge of the particular problem) gives assent to a change several years after the mistake has been discovered.

The men of science should stand for truth and freedom to proclaim the truth. An investigator should not be expected to hold an important contribution three to five years in order to secure the assent of any body to an obviously necessary change. Some scientific men may even desire to exercise a little personal discretion as to what names they will employ. Chaos does not necessarily follow unless we attempt to keep in mind the latest changes in all groups. Some appear to be taking priority too seriously; others propose new genera with inadequate descriptions or figures and, too frequently, in obscure, more or less irrelevant notes; while synonymy may be indicated with even less regard for the convenience of the investigator. These practises are certainly not commendable, since they may be serious stumbling blocks for subsequent workers. The writer believes in the strict application of the law of priority because it appears to be the only ultimately stable basis for nomenclature, and yet he practises or endeavors to practise conservatism in accepting changes in groups with which he is comparatively unfamiliar. A scientific man need not apologize for not using the very latest generic term. He may prefer to retain an open mind toward the innovation and adopt it with the appearance of a comprehensive memoir or a standard catalogue.

Let us see how the strict application of the law of priority works out in the gall midges or Itonidæ, much better known as the Cecidomyiidæ. *Itonida,* it may be recalled, was one of Meigen's names published in 1800, *Cecidomyia* being substituted therefor in 1803. In

the past, *Cecidomyia* has been applied in a restricted sense by different students to forms referable to widely separated tribes (Dasyneuriariæ and Itonidinariæ), not to mention the indiscriminate use of the name for any or almost any gall-making midge. It was necessary, under the old state of affairs, to either know the species or the sense in which the name *Cecidomyia* was used in a paper before one could form a definite concept of the characters for which the term stood in that particular instance. The loose application of this name to a thousand or more species referable to over 150 genera, did not materially enhance the value of the word as a precise scientific designation. In this instance the use of the prior *Itonida*, which has not been misapplied, savors more of common sense than an attempt to put among the *nomina conservanda* the variously defined and loosely applied *Cecidomyia*, even though the latter has become well established and is generally used in economic literature. A survey of the group would show that even if *Cecidomyia* was retained, it could be applied to but one genus, and that would mean that the accepted generic name for most of the economic species must of necessity be changed. *Cecidomyia* is a valuable designation and can and should be employed as the name of a biological group.

The gall midges may present exceptional conditions. We are by no means certain that the strict application of the law of priority means more incumbrances and difficulties than the establishment of *nomina conservanda*. Many of the changes necessitated by the law of priority have been made. Shall we reverse ourselves? If so, how many will accept this change of attitude and to what extent shall we go? If "well-established" or "long-used" names are desirable, how shall we select these? Is usage by the biologist, general zoologist, taxonomist, the economic entomologist or the agriculturist to determine which shall be employed? Further study will inevitably result in closer generic definition. Shall we recognize *Cecidomyia* as a valid genus with *destructor* Say as type because this is the more important agricultural species—and it is the practical entomologist who has done most to make this name current, or accept *pini* DeGeer as type and be compelled to use a less familiar term in economic literature?

In other words, the establishment of *nomina conservanda* may fix the generic term and designate the type, only to find later that the latter is not cogeneric with the species which has made the generic name common property. This is strikingly shown by referring to a few of the well-known American forms which probably would have been changed even if *nomina conservanda* had been in existence. The following are a few well-known species which have been shifted from one genus to another because of a more correct generic definition:

Ægeria exitiosa, now *Sanninoidea*,
Arctia isabella, now *Isia*,
Orgyia leucostigma, now *Hemerocampa*,
Anisopteryx pometaria, now *Alsophila*,
A. vernata, now *Paleacrita*,
Incurvaria acerifoliella, now *Paraclemensia*.

The above names have been widely current as well as many others now relegated to synonymy, and their retention is impossible unless generic limitations are broadened, and then it would be necessary to harmonize very wide divergencies of opinion. Has any one an adequate notion as to just how much relief would be afforded by the establishment of *nomina conservanda*? Is there not a possibility that the benefits supposed to accrue therefrom have been greatly overestimated?

Finally, has sufficient time elapsed to permit a determination of the wisdom or unwisdom of a strict adherence to the law of priority? Can we assure ourselves that a comfortable adjustment to existing conditions is impossible for most individuals?

E. P. Felt

Albany, N. Y.,
May 10, 1912

Hermaphrodite Shad in the Delaware

Instances of hermaphroditism occur occasionally in the shad (*Alosa sapidissima*) taken during the spring in our fisheries, though they are usually so infrequent as to arouse the curiosity of the fishermen. I know of two

cases, both of which specimens were given to me for examination. They were obtained from fully adult fishes, which did not differ externally from the other normal ones with which they were associated. Before being opened both the examples were classed as males or "bucks." The first example was taken near Camden, New Jersey, in March of 1908, by Mr. J. B. Fine. The organs of this fish were of the average size in length, though each lobe was sharply divisible into two sections of nearly equal dimensions, these sections being well constricted where they joined in the middle. The anterior section was composed of milt and the posterior of roe. My other example was secured by Mr. Horace H. Burton at Lovett's fishery near Tullytown, Pa., in April of 1912. It was still more masculine, with the milt very large or as a single body, and the lobes nearly completely atrophied. The roe was quite small, twisted, posterior, and its lobes also more or less distorted by atrophy. Further, the roe exhibited curious milt-like globules or areas of variable size, some comparatively large, in several places.

HENRY W. FOWLER
ACADEMY OF NATURAL SCIENCES
OF PHILADELPHIA,
May 2, 1912

UNIVERSITY CONTROL

LETTERS FROM THE UNIVERSITY OF PENNSYLVANIA

As to heading (1) as I comprehend it the corporation would have no powers of controlling policies. In that case I approve of it. I should not approve of having policies controlled by so heterogeneous a body and one so ignorant of academic questions as are most alumni. I should approve of their having advisory powers as to policy, and direct powers in electing trustees, so that the latter may not elect themselves. (2) I am in doubt about the whole of this section. I think it would be better that the professors should nominate, say two men, to the trustees and let them elect, so that the faculties would still essentially make the choice, but the trustees have a part in the decision. If trustees are to have any usefulness their opinion should be of some value. I think if there is a president at all his powers, dignity and salary should be greater than that of a professor, as high administrative powers are rare and consequently of unusual value, and his duties, if conscientiously carried out, are more trying than those of a professor. Few men would accept them if they gained no added power or income and the position would otherwise be a sort of headdean. I believe some such officer is necessary, in the present age, at any rate, but I do not think he should have power of appointments, but that these should come from the faculty, that is, from the unit-faculty to which the position to be filled belongs, as nominations, and be ratified by the trustees or other advisory board. I am inclined to think that the best way to hold the president in check would be to give him an unlimited term of office, but to give the faculty of the whole university power of veto by a two thirds or three fourths vote in any of his proposals that affected the general university, and perhaps to give the unit-faculties power of veto by a large majority vote—say four fifths, or power to demand that any policy affecting the unit be carried before the whole university faculty and voted upon; and then consider a veto the fall of the ministry. This would probably lead to closer relations between all individuals in the faculties and the presidential policies and conflicts would be settled early by discussion rather than by quarreling. It would involve also that the faculty be officially apprised at all times of what is being planned long before it was done. This is rather half-baked, as I express it. I do think, however, that what we need is to encourage the development of enlightened and able administrators rather than to clip their wings. (3) I approve of this. (4) I highly approve having outside experts called in to decide the choice of professors and I believe this might be required in certain other matters. I do not believe it is possible to pay the same salaries for the same office. This to my mind has the fatal danger that prevails in the labor unions, with

their limitations of productivity and would interfere with progress. If one man is a greater and more important man than another he is worth more to a university than a lesser man, even though both do the same amount of actual university work. I should approve of having a certain percentage of trustees graduates of other institutions and, except in the case of state universities, have, say, half of them reside elsewhere than in the town where the university is situated. I would also require that four fifths of the trustees should themselves be university graduates of some sort. This would still leave some places to be filled by uneducated rich men who know nothing of a university's needs—but not a majority.

I should say that the plan is an excellent one in theory, but whether we shall ever see it tried practically may be a question. Of course universities, like everything else, are a product of evolution. Such institutions in this country appear to have reached the stage where they call for an autocrat, precisely as it appears necessary to have a boss in city and state government. In process of time we may expect the important universities of the country to outgrow this condition of things, but precisely what will take its place no one can say. It is not necessary or desirable that all should be organized on one plan, and perhaps the autocrat may remain a permanent feature of some institutions.

I should very much like to see one or more of the universities of the country put into practise a plan of control along the lines that you have suggested. There is fortunately a rivalry so keen that the universities which best serve the community are going to be those that will most prosper, and service to the community depends fundamentally upon an organization which will attract and hold the best men to its faculties. I have seen thoroughly bad results under the head-professorship system and equally unfortunate conditions in departments largely autonomous, where a group of older men of similar sympathies are holding back progress with serious results. The difficulty is to strike the means by which a department may be left autonomous as long as its actions are progressive, but may be brought up with a firm hand when it appears that a group of its professors are working for selfish ends or are exhibiting evidences of servile incompetency. I am inclined to think that the best checks are through criticism freely expressed by deans and other administrative officers and by committees, and freely asked by the president. The university in which is possible such criticism and consultation among its administrative officers is most fortunate.

Excepting in some minor details, and in the matter of the status of the president, I am entirely in agreement with you. Regarding the president, it seems to me that as conditions are changing much from time to time a longer tenure of office than that of the rectors of German universities would be desirable, and I think that for many reasons it is desirable that greater power should be concentrated in one technically qualified person than your scheme seems to allow. This need not run counter to your idea of a democratic institution, since the power is, after all, delegated from the faculty to the person selected by them for the position of president. An assurance of considerable tenure of office and a somewhat distinctly higher position, both in salary and in dignity of position, should, I think, be given the person known as president.

I believe the reform in university administration which you propose to be a very desirable step in advance. Perhaps I may be permitted to suggest an amplification in one or two points: (1) The meeting of the corporation for the election of trustees should not be under the chairmanship or influence of any of the trustees. Not uncommonly the meeting of a larger body when presided over by a member of the smaller directing body is merely a nominal affair, approving the proposition agreed upon beforehand by the members of the smaller body. The larger body usually does not take the initiative in any matter of

importance whenever members of the smaller directing body take an active part in the proceedings of the larger corporation. (2) The selection of professors and instructors is a most important matter. In the past the selection has been intrusted to administrative officers who usually relied upon the judgment of one or two men prominent in the special field in which a vacancy had to be filled. In very many cases one and the same man had thus the power to fill the most important positions. Such a procedure must naturally lead to conditions somewhat similar to those found in "politics." A personal element will be of influence in the selection of men for professorships. There is danger that the man who is most frequently consulted will, perhaps against his own inclination, be forced to assume the rôle of a political "boss," and that the building up of something like a political machine will result. Men of a certain school will be preferred for the filling of the most important positions. The committee having in charge the selection of a professor should, therefore, as a matter of routine, consult a large number of representatives of a certain field of science, preferably representatives residing in more than one country, in order to eliminate any personal bias, and to effect a selection on the basis of merit. Such a committee should submit the names proposed by the various experts to the senate for final election.

In the main I thoroughly agree with your views. We are certainly sorely in need of a revision of the prevalent methods of running universities. It seems that in most institutions the board of trustees do not look upon the faculty as the living part of the university, but as a lot of laborers who should be placed upon the same basis as "hired help" generally. There is certainly vastly too much politics in professorial life, and there is too much done to please certain interests, right or wrong. In fact there are so many evils and weaknesses that are so manifest in the administration of university affairs and so desirable to be corrected that one could write an elaborate thesis on the subject without seeking for material. This must be a matter of evolution and not of revolution. Your article is in the right direction.

I think your plan of university control on the whole a very good one; but you have not stated how a university senate should be constituted and elected. Further, it seems to me that any nomination for professorship passed by the board of advisers should not be subject to the veto of the trustees.

Your plan seems to safeguard very well the interests both of the organization and of the individual.

I am in thorough sympathy with the plan of university control as outlined by you. Two factors which make for faculty incompetence, in the medical schools at least, are self-interest and the dread of unpopularity among colleagues. This is particularly true of the clinical men whose business interests are not always in accord with a university's interests and for whom popularity is a business asset. These two factors frequently stand in the way of advances of benefit to a university.

I find your plan excellent, and approve of it. I beg to suggest that one indirect effect of the present system has not been mentioned in your indictment: namely, the policy of academic advancement of the man who draws the largest classes, rather than the man who does the best work. It has been my observation that presidential favor is frequently curried in this way, to the detriment of men whose ideals will not permit them to lower the standards of their work for popularity.

I heartily agree with your sentiments as to a strictly democratic organization, where no one man, or group of men, can set themselves up as a dictator. The corporation, to my way of thinking, should consist of several groups of men chosen from different sources of supply. It should consist of, say, fifteen members, selected as follows: the university professors should name three, the alumni organization five, the state legislature three, the educational

board of the state two and the board thus constituted elect two other members from the community at large. These should, with the academic council in joint session, elect a president and a vice-president for five years. The faculty should name the academic council to which the questions of policy should be referred, presided over by the president. The professors, assistant professors and instructors should be assembled into groups, which groups would annually elect a chairman, and preferably in rotation. His sole duty would be to preside at group committee meetings, transmit their communications to the academic council and sign bills and other documents where such signature is necessary. In other words, the chairman of the group would be executive officer of the group for one year. The salaries should be uniform for professors and assistant professors, and of a sum sufficient for their needs and proportioned according to the length of active and honorable service, beginning with a minimum and ending with a maximum. The recommendations for advancement should start in the group committees, pass through the academic council and end with the corporation.

It must be apparent to most sincere and experienced observers of academic life in America that the present deficiencies in our universities are not so much a consequence of faults of organization as of certain fundamental defects in the dominant American conceptions of what the purposes and characteristics of university activities ought to be. The form of organization prevalent in the universities is an expression of the predominant characteristics of the men who are chosen to fill the influential positions. Men whose instincts are for practical life, rather than for study and the advancement of intellectual ideals and achievement, are chosen far too frequently. This is the chief source of weakness, since such men determine what shall be taught, how it shall be taught, the degree of freedom of research and of discussion, the aims which the institution sets before itself, in short the whole course of university policy. Such men admire the business type of man and try to imitate him; the result is that they have imposed on institutions of learning an organization better fitted for definite practical undertakings than for the diversified and largely disinterested activities of an assemblage of scholars. The system, in other words, favors the selection of men who lend themselves most readily to cooperative and directly practical undertakings—rather than of men who, like most true scholars, combine strong individuality with idealism. The evil is self-perpetuating, since almost all men will work effectively or ineffectively, according to the incentives offered; if devotion to study and research is self-penalizing, the number of men who vigorously and whole-heartedly so devote themselves is inevitably diminished. Hence, many university men deliberately prefer to perfect their capabilities in quite other directions than scholarship—even when they are not forced to do so—studying the arts of management, control, compromise, the technique of executive activity, and the like. Is it to be wondered at that the intellectual life of many institutions flags, that our scientific productivity is so far behind that of Europe, and that students of marked originality so frequently fail to receive the stimulus and opportunities they need for their proper development? Under conditions more favorable to the selection of superior men—like those hitherto prevailing in Germany, France or England—the tale would be a very different one. It is not that we lack the ability, but that it fails to realize itself because of a radically wrong basis of selection. I am well aware that there are many distinguished men in the American universities, but far fewer than there ought to be. The present organization of the universities, I repeat, is rather the expression of this deficiency than the cause of it. The fundamental cause lies in the prevailing temper and ideals of university men in this country. There are certain tendencies of American life —to a certain degree of all modern life— which a university should deliberately guard against and oppose. These are, many of them,

to be counted among the more doubtful products of the democratic movement: the prevalence of mediocre or popular standards—*i. e.*, those which the common man can reasonably hope to attain—an uncritical faith in majorities, a pessimistic estimate of the possibilities of individual achievement, over-emphasis of the importance of cooperative activity ("team-play"). A preference for mediocrity and a disposition to neglect, disparage, or hinder men of pronounced genius arise from all this. The organization of the university should therefore encourage a liberal and enlightened individualism; the tendency to make men conform to fixed standards, whether set by academic authority or by what happen to be the fashionable prejudices of the time, should be frowned down, or, still better, laughed down. Under these conditions men of distinguished ability will be far more likely than at present to make their way into universities and to produce their best work. The existing organization of the universities overemphasizes the managerial side for the reasons I have already briefly indicated. Hence I should favor a change in the direction of a general simplification and decentralization. With reference to the reforms you propose, my opinions are very much as follows. I refer to the numbered paragraphs of your article. (1) The professors should undoubtedly form part of the corporation; alumni and other members of the community only in so far as they show real knowledge of university conditions. Such a body could be depended upon to select suitable trustees. (2) The president should be elected by the professors from among their number for a fixed term (*e. g.*) four years. There should be no obstacle or limit to reelection; a good man would thus hold his place. (3) and (4) I favor all possible autonomy to schools, divisions, departments and individuals. Salaries of professors should be adequate and uniform. I am inclined to urge the adoption of a system like the Italian: *i. e.*, election of the professor by men of reputation in his own department of learning, in his own and other universities. (5) I approve of all these suggestions.

LETTERS FROM THE JOHNS HOPKINS UNIVERSITY

With regard to the first proposition, the suggestion of forming a corporation consisting of the professors, officers and alumni, does not meet my approval. The only feature that makes membership in such a corporation desirable is the privilege of voting for trustees. In the first place I do not feel that this privilege alone would suffice to secure a paying membership, such as is contemplated in the proposition. In the second place, I should not like to see trustees chosen by this method. It would seem to me to carry with it all the difficulties inherent in political elections—namely, parties, electioneering machinery—a continual agitation to arouse the interest of the better element to meet the designs of those who were acting from self-interest or ignorance. The most important work of trustees, in my opinion, is to safeguard the financial interests of the university, and for this purpose they should form a small body, the individuals of which should be selected by the board itself, or in the case of state universities by some responsible authority, *e. g.*, the governor of the state. It should be a permanent board made up of citizens of standing, men of integrity and ability, whose interest in public affairs will induce them to accept such a trust in spite of the fact that it brings work and responsibility without any personal profit. I do not feel that a board of this character can be obtained by a general election among alumni. It would be difficult or impossible for the alumni to acquire the information requisite for intelligent voting. In regard to the second proposition, I am heartily in favor of the suggestion that the president shall be appointed by the trustees upon nomination by the faculty—he should be the choice of the faculty—I believe that such a method of selection would strengthen greatly the bonds between president and faculty, especially if there was added the further provision that all appointments and appropriations be made upon recommendation of the faculty or of some board representing the faculty and chosen from its membership by election. I do not, however, agree to the latter part of

proposition (2). I believe that the presidency should be a dignified and desirable office in order to attract the best men. It should be permanent, it ought to carry a salary larger than that of the professor, and the incumbent should be charged especially with the important duty of developing the policy of the university. Some one is needed in this position who is broad-minded enough to sympathize with good movements and to see that they are pushed—to recognize when there is weakness to be overcome or strength to be encouraged. No temporary officer can be expected to keep his mind constantly upon such work. If the office is temporary and carries no special dignity or importance, men will avoid it and, if forced to take it in rotation, will regard it as a necessary evil that they are thankful to escape from. Propositions (3) and (4) meet my general approval. When the size of any department is considerable, it would seem desirable to have its own faculty and dean, to make its own nominations to the staff and its own recommendations for appropriations and other departmental expenditures. As you say, such an organization practically exists for the professional schools, although in many cases the autonomy is not carried far enough, that is to say, it does not extend to appropriations and appointments. I count it unfortunate that there is a tendency to make the deanship in such departmental faculties a practically permanent office. In the case of professional schools that are not really incorporated into the university, such a provision may be necessary, but when the department is organically united to the university the deanship, in my opinion, should be an office filled in rotation, yearly, by the professors of the department. A department is small enough for the professors themselves, as a body, to develop their policy and supervise their own needs, present and future, and the dean should be simply an administrative officer for carrying their actions into effect. The office might properly be regarded as a burdensome duty and not an honor, and the labor might be shared equally so as not to spoil the efficiency of any professor in the proper work of his own subject. In this general respect I should like to see a marked difference made between the position of the president and the dean. The latter now generally fulfil the duties of minor presidents and there is no need, in my opinion, in one and the same university in having a group of men taken away from their proper work. It may very well lead to sharp antagonisms between individuals. In regard to proposition (5) I assume that some such representative body is necessary in large institutions where many departments exist. I would suggest that its most important function should be the recommendation of a proper division of the annual income among the several departments, in addition to acting as a final court in matters affecting the interests of all departments. It should be a representative body subject to change.

I thoroughly agree with (1) and the first part of (2); I think the president should be elected by the faculty and feel responsible to it for appointments, so far as they are in his hands, and general politics, but to the trustees for the financial part. I am inclined to favor a "rector" elected from the full professors for a period of, say, four years; his administrative work should not take him away from his department entirely. I believe that he should have a larger salary and be able to travel and entertain in the name of the university. A four years' tenure would put a man on his mettle, for I think he should be subject to reelection. I see evident weaknesses in this which I shall not discuss. (3) and (4) appeal to me and also (5) except for the last sentence. I do not believe that there is any group of men who abuse their freedom as much as do some university professors and I believe that this abuse tends to lower the average and dignity of all. You see, I am a complete Philistine on this subject. I believe that each head of a department should send the president a written report of his work at least every three months, these reports to be kept on file. I even favor the establishment of rules relating to hours. Of course I believe in

absolute freedom in research, but I think it only fair that we give evidence of being worthy of our position and salary and see no reason for assuming that students and teachers are so different from the rest of mankind as not to need some control.

Along general lines I agree with you, as for instance, that the several faculties (law, medical, etc.) should possess autonomy, should nominate their own professors; that there should be as much flexibility and as little of the department-store system in a university organization as is consistent with the progress of research and with the advancement of learning. On these and many other points I should be at one with you, but when it comes to the details of a scheme such as you have analyzed I should wish time for study of the question—time to study the methods of university control in Germany, England and other countries—before expressing an opinion.

I think we are beginning to see indications for "university control" by the members of the faculty. Our medical faculty here is largely in control, not by right, but by assent. Such responsibility makes us more interested in educational problems, in economy of funds, and breeds loyalty, which, after all, is of the greatest of importance.

I can say that the plan of university organization that you outline strikes me as in its main lines highly desirable, and in its aims altogether excellent. With its leading purpose, that of securing and developing the independence and the individuality of the professor, I am in the heartiest possible sympathy.

On the whole your plan seems to me excellent. It is in accord with the historical development of university organization, and while very different from the plan now followed in America, it seems to me that a gradual adoption of it would be beneficial.

I approve of your scheme of university control.

I read your proposal with much interest and approval. I have no suggestions to offer at the present time.

Such an organization would go a long way towards solving our present difficulties of administration, meaning by "our" those of many institutions throughout the country. My limited experience with university presidents has led me to believe that some of them at least are incompetent. When it comes to new appointments, their lack of knowledge of suitable men to fill vacant positions is often surprising. I am fully convinced that the appointive or nominative power is best in the hands of such a committee as you suggest.

The democratic features of your plan must certainly appeal to all who are intimate with the present unsatisfactory state. I think any attempt at a modification of existing methods of university government should include some means of setting a standard for and effecting a scrutiny of the work of a department head. Existing abuse of the responsibilities of this position should not be lost sight of in your scheme.

I am very much in sympathy with your proposed plan of control of universities. In my estimation the president should have a somewhat higher salary than professors, but the differences that now exist in colleges as well as universities are unreasonable. The excessive (relatively excessive) salary commanded by certain presidents is, owing to their reputation as financial agents. If a man is able to raise money for an institution he can command almost any salary. Just what bearing your plan would have on the financial management of institutions of learning could hardly be predicted. However, it would tend to bring to the head of such institutions men of scholarship rather than men of marked business abilities and such men would undoubtedly, with the cooperation of the professors, as outlined in your plan, be able to direct the real functions of educational institutions infinitely better than an autocratic business executive.

Paragraphs (2) and (4) seem to me to be very well stated; certainly I subscribe to them most heartily. I confess that paragraph (1) is not so clear to me. I see possibilities there of great confusion. The corporation might easily become so large that certain tendencies and attitudes might be forced upon the professors which are not representative of the best interests of the university. If the voting power of the corporation could be so arranged that the professorial vote would represent half of the total and the outside members the other half, I think the plan might work very well. In regard to paragraph (3) it seems worth saying that the plan you call for is rather artificial unless you would hold to a more strict departmental grouping than I think your wording called for. Such large groupings would be hard to make and would eventually lead to friction. I think I am more in favor of autonomy for the professors than for the group, yet such a condition of affairs might lead to anarchy. The grouping psychology, philosophy, chemistry, physics, etc., are natural growths. In certain departments there are only one or two professors; such departments should be grouped by themselves and not forced to become a part of a larger whole.

I am heartily in favor of such a plan. I have been connected with German universities and have talked with a number of professors in Germany, France and England, as well as here in America. I feel very keenly that our present system will have to be modified somewhat according to your proposed plan, and it should be done as soon as possible. We are very fortunate here in Johns Hopkins University, of course, for we have, as you know, a university council which advises the president. Even here, however, there is a tendency toward an autocratic "one man power" in the departments, in that the so-called "director" of the department has considerably more authority than is sometimes wise. Although there is sometimes talk against our "one man system," you see that, as a whole, the wisdom of our leading men here in the university has kept things going on a sane basis. Considering the matter entirely independently of our own immediate surroundings, however, I should like to see a more democratic control established in our American universities.

I agree with you that for the successful development of the American university in the future, a change in the form of administration which at present dominates our higher institutions of learning is imperative. Certain recent developments have shown the danger of concentrating too much power in the hands of any one man. If a professor in one of our leading universities is to be dismissed not only without a trial before a jury of professors, but even without a hearing by the president of the university in question; the dignity and honor appertaining to an American professorship would be so slight that much of the very best intellect of this country would be turned away from the universities into safer channels. The result from this cause alone would be greatly to weaken our higher institutions of learning, and to foster the already overwhelming commercialism of this country. I think the policy outlined in (1) is good, except that I would not have a chancellor. The organization should be kept as simple as possible, to avoid any unnecessary sources of autocracy finding a foothold. All financial matters should be left to the trustees, and they should be expected to secure the necessary endowment. The financial affairs of the institution should be the chief, if not the sole, function of the trustees. I agree with (2), except I would not preserve the name president, since this has now come to have a well-defined significance. I would call the officer in question, perhaps, "rector," as in the German universities. He should be elected for one year, with the possibility of reelection—but in no case should be eligible for more than three years. His salary should be exactly that of a professor and his powers the same as those of any professor. His office, however, should, I think, be looked upon as even more dignified

than that of a professorship. The point made in section (4), that the same salary should be paid for the same office, the same amount of work and the same tenure of office, is, I think, fundamentally important. This is, I believe, the case at Harvard, and largely the case at Yale. The opposite policy of obtaining, and especially of retaining, a professor for the smallest sum to which he, by any method, can be induced to submit, is short-sighted, and not conducive to the highest results. This method fosters discontent, and often indifference and inefficiency. It deals with the professor by the same method that a corporation deals with its hirelings, and thus detracts from the dignity and desirableness of the position. I would add that publicity in all such matters is absolutely essential to the good-will and harmonious working of an institution of learning. It might be urged as an argument in favor of the former, and against the latter system, that one professor is inherently worth more than another; and by the methods at present in vogue in making promotions this is true. But let no one be promoted to the rank of a full professorship in any one of our leading institutions of learning who does not measure up at least to a certain high minimum standard, and then let the salary received by a professor be determined by the years of service in his rank. If I may add a word of a general character in reference to university administration in this country, it would be: model our system as closely as possible, with the conditions existing in this country, after the German universities. Their present system of administration is the outgrowth of years, and in many cases of centuries, of experience. And what is the result? The finest system of higher education, beyond comparison, that the world has ever seen. Indeed, most of the productive men of science in this country, even to-day, have learned their lesson in the German universities, and transplanted research from Teutonic soil to this country. Such results as have been obtained in the German universities could scarcely have been reached under a system of administration that was seriously defective. It might be objected that the conditions in this country are fundamentally different with respect to higher education than those in Germany, and such an objection unfortunately contains a large element of truth. Nevertheless, we should profit by those greatest institutions of learning; adopting their system of administration as nearly as the existing conditions here will permit; and not learning the lesson of university administration all over again from the very beginning by experience. This is, I think, the real solution to the greatest problem in higher education in America to-day.

Your proposals concerning the organization of universities are absolutely in line with my own hopes. Unless the working staff of the university gets a chance to help in the shaping of broader ideals of university life their interest will always be low. The superstition of one-man power is one of the worst impediments to a wider training of a spirit of collaboration, the lack of which makes public life as well as university life an opportunistic medley. It is deplorable that to-day the man who can enlist the cooperation of some financial magnates is a most forcible element in setting the pace in university policies. With regard to detail, I suppose the closer we keep to the English and Scotch pattern the more likely are we to reach the result, on account of the anti-German feeling existing in many quarters. This would mean the adoption of having a chancellor of the university, whereas, personally, I should prefer to have a rotation of the rectorship among the faculties, similar to what exists in the Swiss universities.

I am in hearty sympathy with the underlying principles of your proposals. Taking them up separately: (1) The idea of a large corporation and of elective trustees is undoubtedly right. I think a chancellor essential. (2) The duties of the president are not given in your statement. It seems to me that the chairman of the senate might assume the responsibilities. (3) The idea of subdivision of the faculty into schools is right. I assume

that in most universities the "college" would form a separate school. In which case, the collegiate faculty should, of course, divide and meet at times with the members of the various other schools. (4) I believe in the financial and educational autonomy of the schools. But in regard to nominations of professors, I see no advantage in the "board of advisers"; I think the senate should have the final authority. I doubt the need of giving veto power to the board of trustees. Each school should have the duty of initiating plans for new professorships. There may be certain "standard" or minimum salaries; but I do not believe uniformity is possible or indeed advisable. (5) I would emphasize the duties of the senate, and would, I think, allow the board of trustees to appoint from the faculty a certain number of members. Certainly the membership should be small, less than twenty. The chairman, elected for one year, subject to the approval of the board of trustees, might well perform the so-called duties of the president. You do not make any definite proposal concerning means of contract with the alumni and the public. There should be, I think, an office charged with this duty. At its head should be a most capable man, not a member of the faculty, who might be also the secretary of the senate.

SCIENTIFIC BOOKS

In Northern Mists: Arctic Exploration in Early Times. By Fridtjof Nansen. Translated by Arthur G. Chater. In two volumes. Frederick A. Stokes Company. $8.

These beautifully printed and lavishly illustrated volumes are most interesting, but the reader who turns to them solely for "arctic explorations in early times" will be surprised, for less than one fifth of the matter pertains to polar voyages. Dr. Nansen properly had misgivings when he said, "Many think that too much has been included here." Among such matter falls amber, tin, ship-building from 1,200 years B.C., and other similar and slightly related matter.

Marred though it is by discursive and heterogeneous treatment, the work is of historic value and literary interest. Most comprehensive in its scope of investigation, and in its wealth of assembled material, it will unquestionably prove of value to geographical students as a source whence can be drawn information of, and textual extracts from many rare and little-known works and manuscripts. Its extent and thoroughness may be surmised from the three hundred consulted volumes, and in a dozen languages, whose citations could not be verified under months of labor, let alone the judicial consideration of their pertinency and value.

For the general reader the volumes have value and interest along two lines especially, Greenland and cartography. It is gratifying to find brought together such extended details relative to the early exploration of Greenland by Europeans, and to the interrelated history of the Scandinavian colonization.

In cartography there are more than seventy maps reproduced, in whole or in part, those from the geographical works of the middle ages being the most interesting and valuable.

It is strange that the attractive and well-known woodcuts of Olaus Magnus were not reproduced from the original edition (Rome, 1555). One would have gained a much better idea of the landscapes of Greenland and of Iceland if there had been reproductions of the excellent available photographs made by the Danish officers, instead of the present drawings, which—artistic though they may be—utterly fail to convey clear and accurate conceptions of the polar world.

Neither in novel views nor in their relations to arctic explorations do the accounts of the voyages of Cabot and of the Portuguese merit publication herein. The rehabilitation of Pytheas, of 300 B.C., is ingenious, though much over-elaborated and qualified—necessarily.

The giving of about one sixth of the work to the much-disputed subject of Wineland the Good appears to little purpose. Dr. Nansen's views will not prove acceptable to all the authorities on this mooted subject, which is not finally decided.

Heterogeneous and negative as are Dr. Nansen's opinions that Wineland is a myth based on the Fortunate Isles, yet they are well-considered and merit close attention. His conclusions are briefly as follows: (1) Adam of Bremen is untrustworthy. (2) The oldest Icelandic authorities mention Lief Ericson unconnected with Wineland. (3–4) Lief's discovery is not mentioned until the 13th century, and definite statements as to Wineland only appear at the end of that century. (5) The Flateyjarbok narratives differ widely from the earlier. (6) The first saga contains only mythical and borrowed matter. (7–8) The Greek myths mention wild-growing vines and wheat in the Fortunate Isles. (9) The association of wine and wheat with North America is artificial. (10–15) Before the 11th century Ireland had myths of happy lands to the west in the ocean, thus affording a common basis for the sid-people of Ireland, the elf-people of Iceland, and the huldre-people of Norway. (16–17) The Norse name "*Vinland hit Gooa*" is a translation of "*Insulae Fortunatae.*" (18) The name of the inhabitants, Skraelings, indicates that Wineland was a fairy country. (19) Icelandic and Norse geography connecting Wineland with Africa, is evidence of its identity with the Fortunate Isles. (20) Though the saga of Eric the Red and the "*Groenlendinga-pattyr*" contain no reliable data as to the discovery of America by the Greenlanders, yet the mention of the arrival of voyagers from Markland in 1347, and other references, show that they must have reached the coast of America. (21) Hvitramanna-land is a mythical country, modified by christian beliefs. (22) "Finally, from the ancient Greeks to the Icelanders, Chinese and Japanese, we meet with similar myths about countries out in the ocean and voyages to them."

The intense patriotism of Dr. Nansen in pushing to the broadest possible extent the importance, if not almost universal claims of superiority for Norway in arctic explorations may be viewed as pardonable, though his views will not always gain acceptance.

In his general line of argument it may be said that similar methods by hostile critics would work havoc with many of his finely spun and vigorously advocated conclusions. It is to be regretted that so scholarly a work should not invariably display that fine spirit of judicial calmness, and considerate acceptance of the opposing views, so general in these days on subjects widely controverted. Argument is not made convincing, nor acceptable even, through describing the conclusions of other historical students and investigators as "pure guess work," "absurdity" or as "imaginativeness."

It is to be hoped that the distinguished author will soon contribute a work wherein arctic work shall be fully correlated and brought down to the conquest of the two poles.

A. W. GREELY

Cocoa and Chocolate. Their Chemistry and Manufacture. By R. WHYMPER. Philadelphia, P. Blakiston's Son & Co. Octavo. Pp. xii+319 and index. $5.00.

This work, which does credit to author, printer and publisher, is a striking example of the development that characterizes present-day science. Not many years ago a few pages in a work on food production or food analysis would have been deemed sufficient for the subject.

The author brings to the consideration of the subject matter of the book not only experience and scientific judgment but an earnest interest in the cacao products and we can have but little doubt that he enjoys a cup of "cocoa," in which enjoyment the reviewer shares.

Brief but comprehensive chapters are given on the history of the introduction and use of cacao products, on the botany and nomenclature of the several preparations, after which the growth, manufacture and marketing are considered. A table shows comparison of the calories of cacao preparations with those of common food articles by which it appears that chocolate has three times the heat energy of an equal weight of hen's eggs and nearly double that of peas and bread. Of course, these comparisons, considered by themselves,

will be quite misleading, as no account is taken of the relative cost of the articles—surely an important matter in these days—but also the fact must be borne in mind that in the free consumption of cacao-products a notable amount of an alkaloid is introduced while in standard foods no such ingestion occurs. Notwithstanding the high calories and even high protein content of cacao-products we should err in regarding them as more than beverages and confections.

We are informed that while *Theobroma cacao* is the principal source of cacao-products, several other species contribute a not important share. It is satisfactory to note that while commercial conditions necessitate the use of the term "cocoa" as a name for the marketed products, the author emphasizes the fact that the correct title is "cacao" and uses this when speaking of the raw materials and also the separated fat, which is (very properly) termed "cacao-butter." Incidentally another important point is noted, namely, that the oil from the fruit of the *Cocos nucifera* should be termed "coconut oil" and not, as is often done, "cocoanut oil." For thus aiding in correct orthography Mr. Whymper deserves thanks.

The methods of cultivation, ingathering and curing are given in great detail, illustrated with many fine full-page photogravures. The machinery employed in manufacturing the several commercial preparations is also illustrated and described. Of course, the cacao plant is subject to diseases, but it is specially interesting to note that in many places its successful cultivation requires the association of other trees for shade, and that these latter sometimes communicate their diseases to the cacao nut. In this connection it is worth pointing out that it has been long known that sandalwood trees do not thrive when grown by themselves, and it was supposed that this is due to need of shade, but it has lately been proved by the investigations in India that sandalwood is a partial root-parasite. In Trinidad a particular luguminous tree is so commonly used as a shade for cacao that it is known as "Mother of Cacao."

The food chemist will find in this work a vast amount of important and interesting technologic and analytic data. The commercial forms of "cocoa" and "chocolate" are fully explained both as to preparation, composition, analytic examination and adulteration. Over one hundred pages are devoted to these topics, and the bibliography, a summary of which is given separately, covers a very wide range.

No important typographic errors have been noted. On p. 65, the date for the reference to *Chem. Zeit.* should apparently be 1897, instead of 1887.

The book is a timely and valuable contribution to the literature of an important topic.

Henry Leffmann

SPECIAL ARTICLES

ELM LEAF CURL AND WOOLLY APHID OF THE APPLE

It was with considerable astonishment while working over some elm aphids several winters ago that I found that I was unable to separate on structural characters certain collections of *Schizoneura americana* (causing and inhabiting elm leaf curl) from certain collections of *Schizoneura lanigera* (the troublesome woolly aphid of the apple). It seemed absurd to suppose that a species under such constant observation as the woolly aphid of the apple could be masquerading on our elms all these years without biological evidence of the fact having been chanced upon long ago.

However, the guess based on structural evidence, wild as it seemed, was worth following up and field observations were made during the next seasons. Spring migrants were observed to desert the elm leaves in the early summer, and fall migrants to leave the apple branches in the fall, but no conclusive data as to the destination of either were obtained in the field. Both migrations covered a rather extended time and the situation was especially complicated by the continuous presence of apterous forms on the apple (either on branch or root) all the year and of *"rileyi"* on the trunks of young elms during the summer.

This past winter preparations for a migration test under control conditions were made by raising from seed young apple trees in a greenhouse safe from any possible infestation of the "woolly aphid."

This spring elm leaf curl was obtained from the south and the emerging winged forms were caged over apple seedlings while depositing their young. As a result, the progeny, a fine lot of nymphs that are growing along creases where the thin bark is scaling back, in the axils of the leaves and on exposed roots of the apple seedlings, covered by a typical flocculent white secretion, would be pronounced "woolly aphid of the apple" by any nursery inspector.

Though several kinks in the life cycle of this important species remain to be deciphered, the synonymy of *Schizoneura lanigera* Hausman (*S. americana* Riley) is the chief step in their solution. If the American species on elm is the same as the European species, our orchard pest, the woolly aphid, will revert to the name *Schizoneura ulmi* Linn.

Extended tests for the range of food plants of this species are under way, the reception of southern specimens adding about two months to the time possible for experimentation with the progeny of the spring migrants; which as they will be treated in detail later, need not be further indicated in this preliminary note.

EDITH M. PATCH

MAINE AGRICULTURAL EXPERIMENT STATION

A METHOD FOR THE REMOVAL OF THE TOXIC PROPERTIES FROM COTTONSEED MEAL

A PRELIMINARY REPORT

IN our studies upon cottonseed meal intoxication we have used a method of treatment which has rendered the meal non-toxic to rabbits. We desire to test the treatment further with other meals and with other classes of animals, and we desire also, if these experiments result favorably to devise a method by which the treatment may be used upon a commercial scale. As it will take some time to carry out these experiments we wish to make this preliminary publication and to request others who are engaged in cottonseed meal studies to repeat our work so that the method may be thoroughly tested before being offered for use for commercial purposes.

Our experiment was as follows: 630 grams cottonseed meal previously extracted with gasoline were boiled on a water bath for two hours with 2 liters of alcohol to which had been added 40 c.c. of an aqueous solution containing 20 grams of NaOH, previous experiments having shown that this amount of NaOH was a little more than enough to combine with all the meal. The mass was filtered while hot, washed with hot alcohol and dried. 14.6 grams corresponding to 15 grams of meal were fed daily since March 18, 1912, to each of six rabbits averaging 1,992 grams in weight. These rabbits are all in good condition to-day (April 25, 1912) after 39 days' feeding, but have lost upon an average 134 grams. The feed eaten corresponds to 7.5 grams of cottonseed meal daily for each kilogram of initial weight of rabbit or a total of 292 grams per kilo for the 39 days.

Previous experiments with rabbits have shown that 7.7 grams of cottonseed meal fed daily per kilogram of initial weight of rabbit is fatal on an average after 13 days' feeding or a total of 100 grams per kilo of initial live weight. Our feed No. 189 has run for three times that period, the daily feed is practically the same and the total amount consumed is nearly three times as great. From this we conclude that the alkaline treatment very greatly diminishes if it does not entirely remove the toxic properties of the meal. This feed contains 1.70 per cent. of sodium instead of 0.04 per cent. as in the untreated meal. The beneficial effect of the alkaline treatment may be due to hydrolysis, or to the formation of a sodium salt, or to some other change not yet determined definitely.

We request that those who repeat our work follow the method closely, except to use 40 grams of NaOH instead of 20 grams.

We wish to acknowledge our obligation to Mr. R. S. Curtis, animal husbandman, and to

Dr. G. A. Roberts, veterinarian, both of this station, for their valuable assistance and co-operation.

W. A. Withers
B. J. Ray

North Carolina Agricultural
Experiment Station,
Raleigh, N. C.,
April 25, 1912

SOCIETIES AND ACADEMIES

THE ACADEMY OF SCIENCE OF ST. LOUIS

The Academy of Science of St. Louis met at the Academy building Monday evening, April 15, 1912, President Engler in the chair; an attendance of 65.

Professor A. S. Langsdorf, of Washington University, addressed the academy on "Transient Electrical Phenomena." The analogous conditions in various forms of mechanical systems and electrical circuits was shown and this was followed by a discussion of oscillating currents that may be produced in a transmission line. The necessity for guarding against excessive and dangerous voltages and currents arising from oscillation was pointed out, particular attention being given to the conditions obtaining in a transformer at the moment of switching such a device on to the live current. Finally the short circuit conditions in large alternating current generators was described so that dangerous rises of voltage accompanied by a rush of current could occur and the measures employed to prevent this condition were explained.

Dr. Charles H. Turner gave an illustrated account of "Results of Recent Experiments on the Homing of Ants." The results of the various investigators on the behavior of ants was divided into four groups and briefly discussed. About ten years ago the author began a series of experiments on ants and the main purpose of this paper was to compare the results obtained with those of Cornetz and Santsci. After a detailed comparison the final conclusion from all these experiments was summed up as follows: "Ants are much more than reflex machines; they are self-acting creatures guided by memories of past individual experience. These associative memories are usually complexes of sensations contributed by several different kinds of sense organs and include an awareness of distances and of direction."

Dr. Arthur E. Bostwick, of the St. Louis Public Library, read a paper on "Atomic Theories of Energy."

Professor Wm. H. Roever, of Washington University, exhibited and explained "A Mechanism for Illustrating Lines of Force."

The Academy of Science of St. Louis met at the Academy building Monday evening, May 6, 1912, President Engler in the chair.

Professor J. F. Abbott talked on "The Water Boatmen, an Unexplored Corner of the Insect World." After giving an account of the systematic position of the water boatmen, Professor Abbott discusses their development from the egg to maturity, a particularly interesting feature being the deposition of the eggs upon the bodies of crayfish.

Dr. Charles M. Gill gave an illustrated talk on "Recreation Studies in Estes Park, Colorado." The ascent of Long's Peak was described and some of the more interesting glaciers discussed. The necessity of protecting the natural conditions of Estes Park, for which a bill is now pending before congress, was referred to.

Mr. Frederick Hecker, of Kansas City, discussed the "Microscopical Study of Living Organisms and their Growth Rate," following it with a demonstration of the technique involved.

The Academy of Science of St. Louis met at the Academy building Monday evening, May 20, President Engler in the chair.

Dr. A. S. Pearse, of St. Louis University, gave an illustrated talk on "Fiddler Crabs" with particular reference to the color variation in the forms found at Manila, P. I.

Mr. Phil Rau read a paper on the life history of the "Devil Horse." After giving a detailed account of the anatomy of the devil horse, or praying mantis, the author described the character of the egg case, the emergence of the mantis from this case and the carnivorous habit of the insect. As the result of his series of experiments made to determine how and why the colors of the mantis change, Mr. Rau found that the green nymphs are capable of changing to a dark gray when the environment is dark and when once the gray color is acquired it is permanent despite any environmental conditions. Green insects in all probability remain green indefinitely if the environment is favorable to that color. The paper concluded with some observations regarding the mating habits of the mantis and a detailed description of the making of the egg case.

George T. Moore,
Corresponding Secretary